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**Longitudinal evaluation of MPIO-labeled stem cell biodistribution in glioblastoma using high resolution and contrast-enhanced MR imaging at 14.1Tesla.**

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**Public Summary:**

**Scientific Abstract:**

To optimize the development of stem cell (SC)-based therapies for the treatment of glioblastoma (GBM), we compared the pathotropism of 2 SC sources, human mesenchymal stem cells (hMSCs) and fetal neural stem cells (fNSCs), toward 2 orthotopic GBM models, circumscribed U87vIII and highly infiltrative GBM26. High resolution and contrast-enhanced (CE) magnetic resonance imaging (MRI) were performed at 14.1Tesla to longitudinally monitor the in vivo location of hMSCs and fNSCs labeled with the same amount of micron-size particles of iron oxide (MPIO). To assess pathotropism, SCs were injected in the contralateral hemisphere of U87vIII tumor-bearing mice. Both MPIO-labeled SC types exhibited tropism to tumors, first localizing at the tumor edges, then in the tumor masses. MPIO-labeled hMSCs and fNSCs were also injected intratumorally in mice with U87vIII or GBM26 tumors to assess their biodistribution. Both SC types distributed throughout the tumor in both GBM models. Of interest, in the U87vIII model, areas of hyposignal colocalized first with the enhancing regions (ie, regions of high vascular permeability), consistent with SC tropism to vascular endothelial growth factor. In the GBM26 model, no rim of hyposignal was observed, consistent with the infiltrative nature of this tumor. Quantitative analysis of the index of dispersion confirmed that both MPIO-labeled SC types longitudinally distribute inside the tumor masses after intratumoral injection. Histological studies confirmed the MRI results. In summary, our results indicate that hMSCs and fNSCs exhibit similar properties regarding tumor tropism and intratumoral dissemination, highlighting the potential of these 2 SC sources as adequate candidates for SC-based therapies.

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